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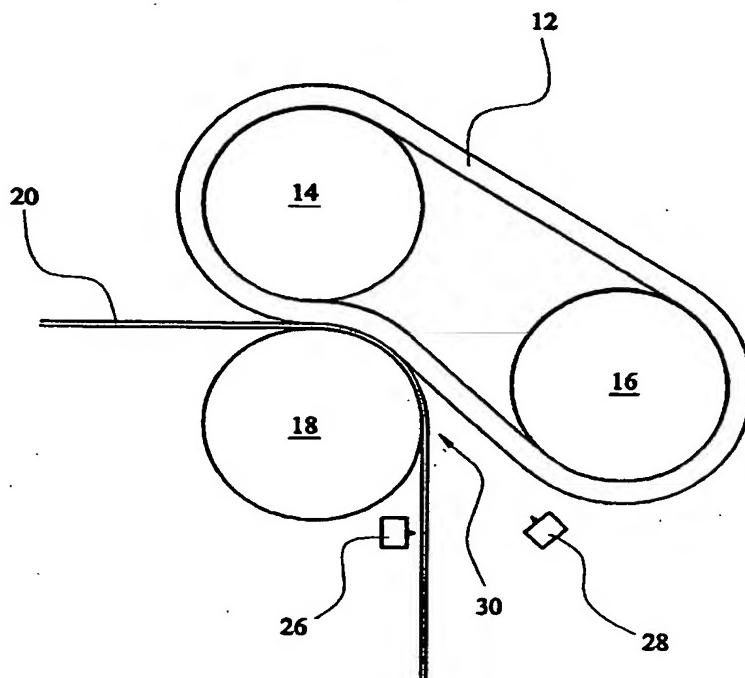
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(54) Title: METHOD OF PRODUCING STRETCHABLE FABRICS



(57) Abstract: A method of treating a woven fabric of thermoplastic synthetic fibres to produce a two-way stretchable fabric (20) which comprises providing a fabric (20) having stretch characteristics in the width direction, applying heat and pressure to the fabric (20) in such a manner that the yarn strands substantially across the width of the fabric (20) are forced closer together thus imparting stretch into the fabric (20) in the length direction. The fabric (20) material is a synthetic material which is thermoplastic and can be heat set, such as a polyester or polyamide textile material. Stretch in the width direction (normally the weft direction) may be produced conventionally, but owing to processing constraints, it is not normally as easy to produce as much stretch in the length (or warp) direction. By subjecting such a fabric (20) to compressive shrinkage, the stretch in the warp direction is increased. Moreover, owing to the thermoplastic nature of the yarns, this stretch is heat set and is therefore "permanent".

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METHOD OF PRODUCING STRETCHABLE FABRICS

This invention relates to a process for treating fabric and to the fabric produced, particularly but not exclusively for application in clothing manufacture, which enables a certain degree and type of stretch to be imparted to, for example, an lining fabric.

In our European patent publication EP-B-0705356 we disclose a method of treating a woven fabric characterised in the combination of two stages - a first stage which includes applying heat and pressure to the fabric in such a manner that the yarn strands substantially across the width of the fabric are forced closer together thus imparting generally semi-permanent "ease" or "stretch" into the fabric, and a subsequent, second stage which includes affixing to the fabric treated according to the first stage of the method a selected lining and/or lining combination having inherent stretch whereby the semi-permanent "ease" or "stretch" imparted to the fabric during the first stage is made substantially permanent during the second stage.

The method of the above invention is preferably carried out by the machine as described therein which comprises means for applying heat and pressure to a woven fabric, and transport means for effecting relative movement between the heat and pressure application means and the fabric whereby passage of the fabric through the apparatus results in the yarn strands substantially across the width of the fabric being forced closer together thus imparting semi-permanent stretch into the fabric. This process may be described as "compressive shrinking" for the purposes of simplicity in the present description. When applied to a non-synthetic woven fabric, compressive shrinking produces stretch but this is not permanent in the sense that it is gradually lost or, if a subsequent heat or steam treatment is applied, will be lost completely at once. Thus, in the process of our above-mentioned European patent publication, the second stage was used to fix, or render "permanent", the stretch characteristics. Compressive shrinking is not normally used with synthetic, thermoplastic, fibres since these can be made stretchy by other known means, e.g. crimping the fibres.

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There are a variety of stretch fabrics on the market which do not incorporate elastomers such as Lycra. These are sometimes described as 'mechanical stretch' materials, normally being of a synthetic material such as polyester. Stretch is achieved by mechanical means such as crimping the fibres and/or utilising the natural thermal shrinkage of the fibre during heat setting. The stretch in the width direction (normally the weft direction) may be produced conventionally, but owing to processing constraints, it is not normally as easy to produce as much stretch in the length (or warp) direction.

The present invention seeks to provide a method of producing a synthetic fabric with linear or warp stretch properties which can additionally, if desired, be in combination with known techniques for achieving stretch across the width or weft.

According to the present invention there is provided a method of treating a woven fabric of thermoplastic synthetic fibres to produce a two-way stretchable fabric which comprises providing a fabric having stretch characteristics in the width direction, applying heat and pressure to the fabric in such a manner that the yarn strands substantially across the width of the fabric are forced closer together thus imparting stretch into the fabric in the length direction.

The fabric material is a synthetic material which is thermoplastic and can be heat set, such as a polyester or polyamide textile material.

As mentioned above, stretch in the width direction (normally the weft direction) may be produced conventionally, but owing to processing constraints, it is not normally as easy to produce as much stretch in the length (or warp) direction. By subjecting such a fabric to compressive shrinkage, the stretch in the warp direction is increased. Moreover, owing to the thermoplastic nature of the yarns, this stretch is heat set and is therefore 'permanent'. Such fabrics are ideal lining fabrics, particularly for lining garments which themselves have stretch characteristics, e.g. produced with Lycra or equivalent yarns. Skirts, especially, produced with bi-stretch or warp stretch fabrics need to utilise linings with similar characteristics. The invention is capable of producing such linings at a competitive cost in comparison to Elastane or Lycra based linings. In addition, jacquard and other

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plain or printed ribboning, tape or labelling can benefit from the process of the invention. As well as woven fabrics, synthetic non-woven or knitted fabrics can be given extra stretch in accordance with the invention.

Moreover, it has been found that the compressive shrinking process imparts a sheen to one of the fabric surfaces, which is an additional advantage of the process when used for lining fabrics. The sheen provides the fabric with a 'kind' feel when next to the skin of the wearer.

The material used may be a fine woven polyamide or polyester fabric, preferably the latter and may already be an lining fabric. Treating it in accordance with the invention improves its stretch characteristics in the warp direction.

One passage through the machine will usually be sufficient to produce the finished product.

As before, the fabric may be treated in full width form or in narrow width.

It has been found that, at the temperature normally used in the compressive shrinking process the lining fabric, a thermoplastic synthetic material, typically a polyester fabric, is heat set so that the extra elasticity imparted to it by the compressive shrinking process is rendered "permanent". Many synthetic materials need to be processed at relatively high temperatures, e.g. 180-200°C and we have found that the material used in our above mentioned compressive shrinking machine needs to be modified. The sleeve used is normally made from rubber, but this becomes degraded and hard at these temperatures. It is preferred to use a sleeve compound such as EPDM in order to overcome this.

While the fabric of the invention is primarily useful for linings, it is not so-limited. Other uses will become apparent to those skilled in the art.

The invention further extends to the fabric produced in accordance with the method of the invention.

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The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic side view of the machine of our European patent publication EP-B-0705356 processing material; and

Figure 2 is a similar view to Figure 1 of a modified machine.

Referring to the drawings, and firstly Figure 1, in essence the compressive shrinking machine generally designated 10 comprises a rubber sleeve 12 running on two rollers 14,16 driven by a heated roller 18.

Fabric 20 is fed into the nip between the roller 18 and the sleeve 12. The positioning of the roller 18 causes the path of the sleeve to change from convex to concave in the area 22. - this is where the fabric 20 is compressed.

In conventional compressive shrinking equipment the fabric is pulled away from the equivalent of the zone 22. However, because the fibres are still hot and malleable, the tension causes any shrinking effect to be reduced or lost completely as the fibres have not yet set. The above mentioned machine allows the fabric to fall away (under no tension) and the shrinkage is retained. The problem with many synthetic fabrics, particularly polyester, is that static electricity is generated which causes the fabric to stick to the sleeve along zone 24 until 'dragged' off, destroying or reducing the stretch effect for the above reason.

Turning now to figure 2, in accordance with the present invention two grounded anti-static bars 26,28 are positioned to remove static from the system allowing the fabric 24 to fall away from the roller 18 at 30, preserving the stretch imparted in the nip.

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CLAIMS

1. A method of treating a woven fabric of thermoplastic synthetic fibres to produce a two-way stretchable fabric which comprises providing a fabric optionally having stretch characteristics in the width direction, applying heat and pressure to the fabric in such a manner that the yarn strands substantially across the width of the fabric are forced closer together thus imparting stretch into the fabric in the length direction.
2. A method as claimed in claim 1 wherein the fabric material is a synthetic material which is thermoplastic and can be heat set.
3. A method as claimed in claim 2 wherein the fabric is made from a polyester or polyamide textile material.
4. A method as claimed in any of claims 1 to 3 in which the fabric is a lining fabric.
5. A method as claimed in any of claims 1 to 4 wherein the processing temperature is in the range 80-200°C.

6. A method as claimed in claim 5 wherein the sleeve in the processing machine is made from EPDM.
7. A fabric produced in accordance with the method of any of the preceding claims.

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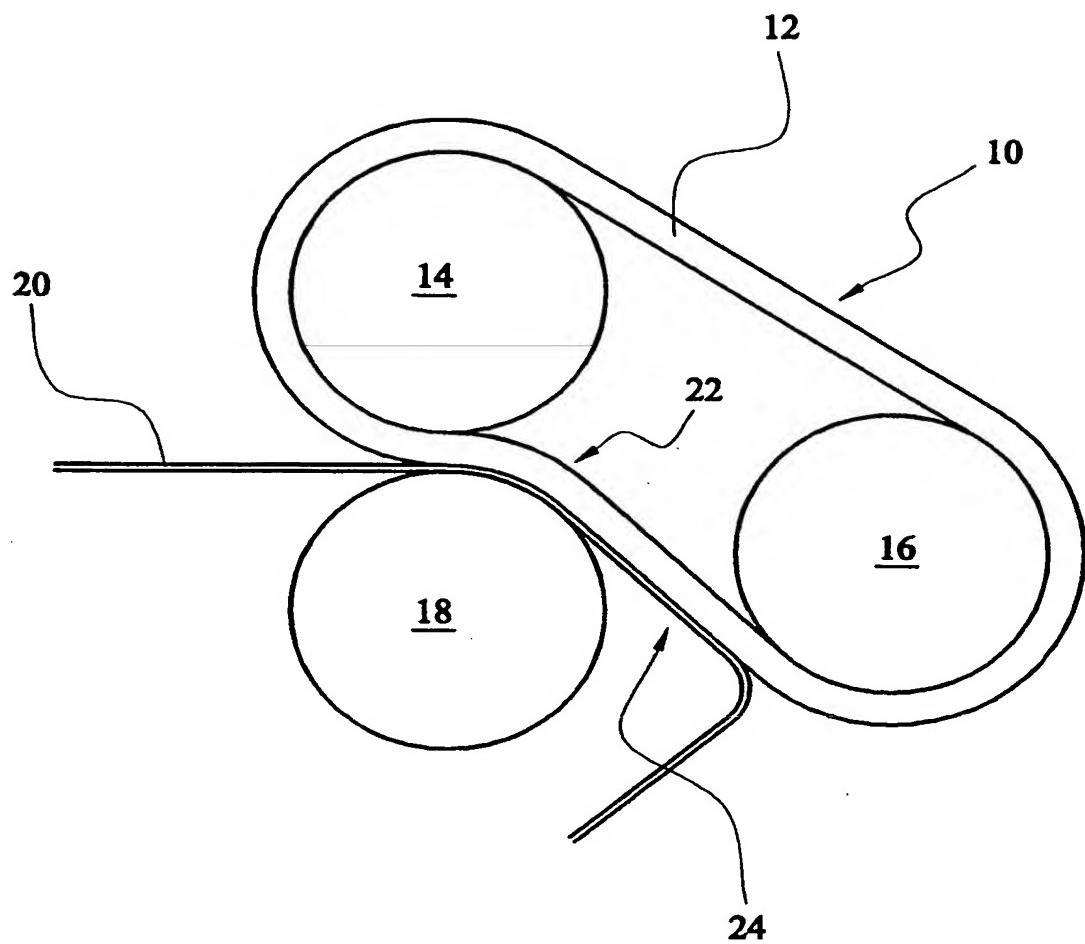


FIG. 1

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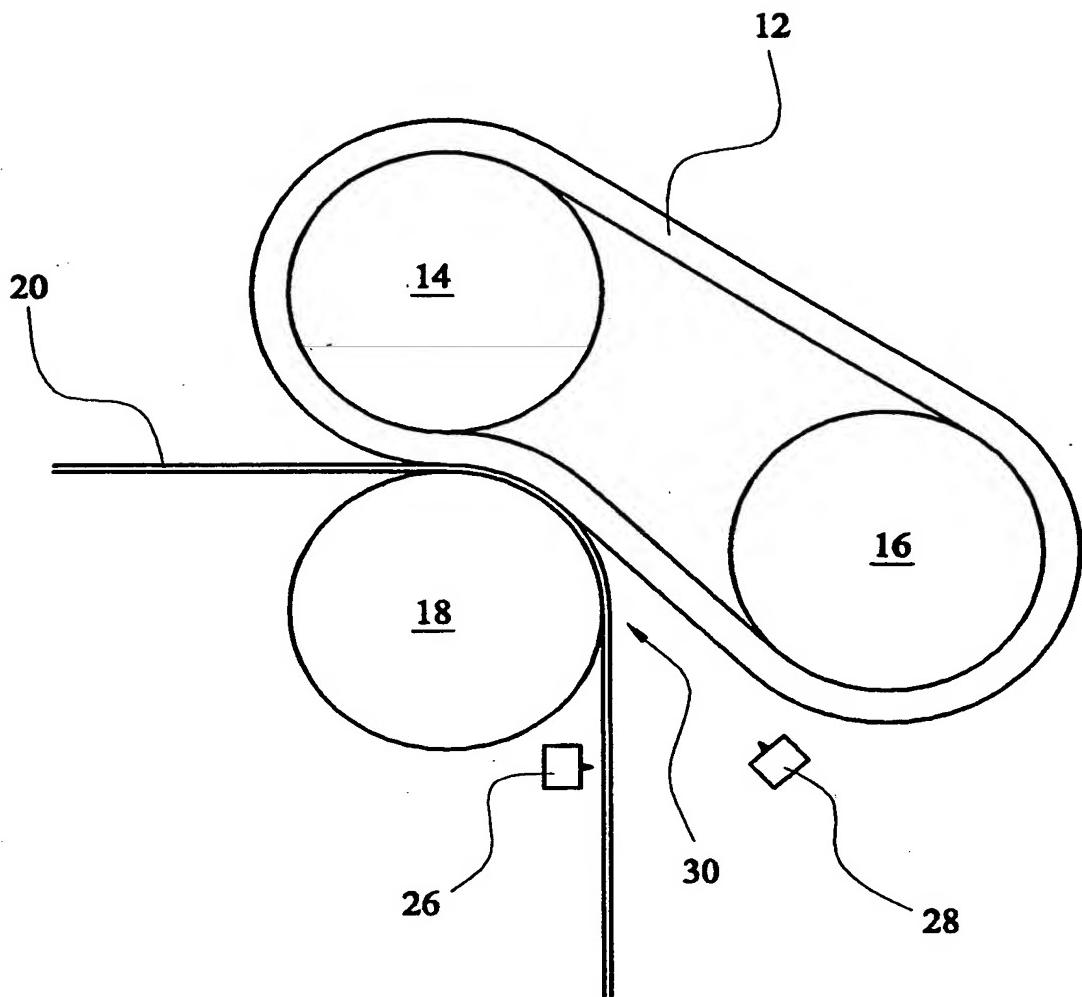


FIG. 2

INTERNATIONAL SEARCH REPORT

Internat'l Application No
PCT/GB 00/02955

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 D06C21/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 D06C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 001 262 A (C.S. PARKER; A. MELVILLE) 26 September 1961 (1961-09-26) column 1, line 39 -column 2, line 14 column 2, line 65 -column 3, line 40 ----	1-3,5,7
X	US 3 538 563 A (M. TSURATA ET AL) 10 November 1970 (1970-11-10) column 1, line 28 - line 61 column 2, line 28 -column 3, line 25 ----	1-3,5,7
A	US 2 021 975 A (J.H. WRIGLEY; A. MELVILLE) 26 November 1935 (1935-11-26) page 5, line 55 -page 6, line 2 -----	1,7

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/02955

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 3001262	A	26-09-1961	GB	777449 A		
US 3538563	A	10-11-1970	CH	337568 A	26-02-1971	
			CH	508767 B	15-06-1971	
			DE	1710504 A	10-05-1972	
			FR	1564811 A	25-04-1969	
			GB	1211304 A	04-11-1970	
US 2021975	A	26-11-1935		NONE		